Association for Information Systems
AIS Electronic Library (AISeL)

PACIS 2006 Proceedings

Pacific Asia Conference on Information Systems (PACIS)

2006

Antecedents of Knowledge Management Systems Adoption and Diffusion in Australia: A Partial Least Square Approach

Jun Xu
Southern Cross University, Australia, jun.xu@scu.edu.au

Mohammed Quaddus
Curtin University of Technology, Australia, quaddusm@gsb.curtin.edu.au

Antecedents of Knowledge Management Systems Adoption and Diffusion in Australia: A Partial Least Square Approach

Jun Xu
Southern Cross University, Australia
jun.xu@scu.edu.au

Mohammed Quaddus
Curtin University of Technology, Australia
QuaddusM@gsb.curtin.edu.au

Abstract

This study investigates the factors influencing the adoption and diffusion of Knowledge Management Systems (KMSs) in Australia. The data was collected via a nationwide survey and was analyzed through partial least square (PLS) approach. The results indicate that external inspiring, organizational factors and task complexity are the significant factors that influence the perceived usefulness of KMSs which, in turn, significantly influences the intention to adopt a KMS and its diffusion process. Some unexpected results were also found. The paper highlights some important antecedents of KMS diffusion process which will be useful to the developers of KMS and various organizations embarking on the adoption of KMS.

Keywords: Knowledge management, Knowledge Management Systems, Adoption and Diffusion, National Survey, Partial Least Square

1. Introduction

As a result of tough competition in the marketplace and the shift from a resource-based economy to a knowledge-based economy, companies are looking more and more at gaining competitive advantage through managing and maximizing their most valuable asset – knowledge. In line with the increasing need to manage knowledge in a more effective and systematic way, knowledge management systems (KMSs), which involve the application of

IT systems and other organizational resources to manage knowledge strategically, are growing in popularity. However there is a scarcity of studies on the empirical perspectives of KMSs, especially in the area of adoption and diffusion.

This research tries to address this gap by studying the adoption and diffusion of KMSs in Australian organizations. Specifically, we want to find the significant factors of the KMS adoption and diffusion process. The paper reports the results of a national mail survey which was conducted with the top 1500 (based on revenue) organizations in Australia. The paper is organized as follows. The following section presents the background literature to put our research in the context of KM and KMS literature. A number of hypotheses are then proposed. This is followed by the demographic information of the national survey. The data analysis through partial least square approach is also presented in this section. The paper concludes with the future directions and conclusion.

2. Background

2.1 Knowledge Management

Knowledge management is "an approach to adding or creating value by more actively leveraging the know-how, experience, and judgment reside within and, in many cases, outside of an organization." (Ruggles 1998, pp.80). The "know-how" aspect of KM emphasizes the "explicit" knowledge, which can be easily captured and codified. On the other hand the "experience" and "judgment" aspects of KM reflect the "tacit" or "implicit" knowledge, which is difficult to capture and formalize. The definition also emphasizes that primary purpose of knowledge management is to add or create "value".

2.2 Knowledge Management Systems

To add value there is a need for knowledge management system (KMS), which facilitates the generation, preservation and sharing of knowledge (Duke et al.1999). In this research, an operational definition of KMS was developed from Alavi and Leidner (1999) as follows:

Knowledge management system (KMS) is a broad way or approach to deal with the generation, preservation, and sharing of both tacit and explicit knowledge within and outside of the organization, which essentially involves the applications of Information Technology systems and other organizational resources.

Some of the common applications of KMS are: (1) organizing and sharing/ transferring of internal benchmarks/best practices, (2) constructing corporate knowledge directories, such as corporate yellow pages, people information archive, etc., (3) creating knowledge networks

and knowledge maps; among many others (Alavi & Leidner 2001). Literature on KMS primarily deals with pros and cons, and various applications. Empirical study on KMS is very scarce. This study thus adds to the body of literature through the empirical study on the adoption and diffusion of KMS.

3. Hypotheses of the Study

Based on the literature review, field study, and other exploratory research, the following hypotheses were proposed. The hypotheses have been grouped under External Factors, Perceptions and Diffusion to reflect the high-level generic model (see Figure-1). Due to space limitations the constructs are not described fully in the paper. However, they are quite intuitive.

Hypotheses related to External Factors:

H1: 'External Inspiring' factor positively influences the 'Perceived Usefulness' of KMS.

H2: 'Individual factor' positively influences the 'Perceived Usefulness' of KMS.

H3: 'Organizational factor' positively influences the 'Perceived Usefulness' of KMS.

H4: 'Management Support' positively influences the 'Perceived Usefulness' of KMS.

H5: 'KMS Characteristics' positively influence the 'Perceived Usefulness' of KMS.

H6: 'Task Complexity' factor positively influences the 'Perceived Usefulness' of KMS.

Hypotheses related to Perceptions regarding KMS:

H7: 'Perceived User-Friendliness' of KMS positively influences the 'Perceived Usefulness' of KMS.

H8: 'Perceived User-Friendliness' of KMS positively influences the 'Organic Growth' of KMS in organizations.

H9: 'Voluntary use' of KMS positively influences the 'Organic Growth' of KMS in organizations.

H10: Use of KMS via organizational 'norm' positively influences the 'Organic Growth' of KMS.

H11: 'Perceived Usefulness' of KMS positively influences the 'Initiation' of KMS in organizations.

Hypotheses related to Diffusion of KMS:

H12: Successful 'Initiation' of KMS positively influences the 'Adoption' of KMS in organizations.

H13: Successful 'Adoption' of KMS positively influences the 'Pilot Implementation' of KMS in organizations.

H14: Successful 'Pilot Implementation' of KMS positively influences the 'Organic Growth' of KMS in organizations.

H15: 'Organic Growth' of KMS positively influences the 'Organization-wide Implementation' of KMS.

H16: 'Organization-wide Implementation' of KMS positively influences the 'Diffusion' of KMS in organizations.

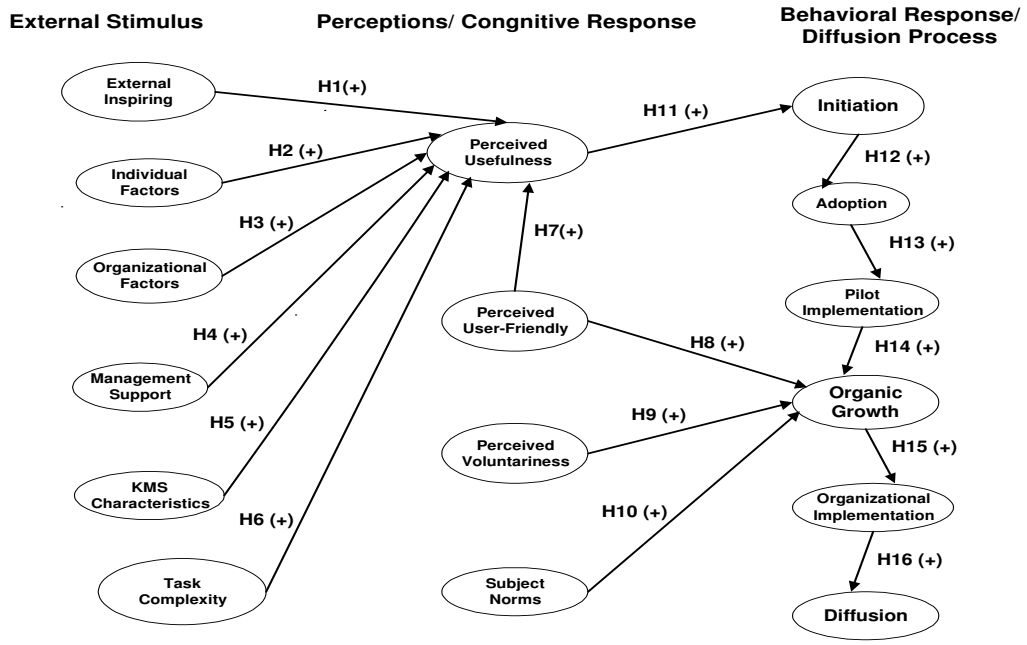

Figure-1 Structural Model for Hypotheses Testing

4. Results of the National Survey

The national survey was conducted among top 1,500 (based on revenue) organizations in Australia. The questionnaires were distributed to 1500 managers in those companies, who appeared to be most relevant to our study. In the end, 285 valid responses were received. Thus the final effective response rate was 23%.

4.1 Demographic Information

21.1% of the respondents were holding the position of middle functional managers, 38.6% were senior managers, 16.1% were KM coordinator/KM manager/Chief Knowledge Officers and 23.5% were Chief Information Officer (CIO)/IS & IT Manager/IS & IT Director. 87% of the respondents declared that KM is part of his/her job. Distribution of the respondents by industry was as follows: 4.2% in Agriculture/Forestry/Fishing, 11.6% in Mining, 7.7% in Construction, 22.5% in Electricity/Gas/water, 6.7% in Whole Trade, 5.3% in Retail Trade, 3.9% in Transportation and Storage, 3.2% in Communication Services, 9% in Finance, 3.5% in Property and Business Services, 3.2% in Health and Community Services, 1.8% in Cultural and Recreational Services, 11.2% in Personal and other Services. The top ten most widely used KMS technologies were (in the order): E-mail & Communication Systems (91.9%), Internet (89.5%), Databases (86.0%), Intranet (80.0%), Document Management Systems (60.0%), Customer Management Systems (48.1%), Video Conference (43.2%), Online Discussion Forum (40.4%), Workflow Systems (38.6%), Data warehousing/mining (36.5%) and Search & Retrieval tools (36%). The national survey data was analysed by Structural Equation Modelling approach using PLS-Graph 3.0.

4.2 Assessment of Measurement Properties

Table-1 shows the final item loadings after deleting items with less than value of 0.5.

Table-1: **Item Loadings**

Items	Loading	Items	Loading	Items	Loading	Items	Loading
EX1	0.8369	MS1	0.7355	UF1	0.8351	AD3	0.7836
EX2	0.8780	MS3	0.6692	UF3	0.8857	PT1	0.8704
ID2	0.6213	MS2	0.5774	UF4	0.7503	PT2	0.8028
ID3	0.6625	MS4	0.7735	SN1	0.6600	PT3	0.7616
ID4	0.7547	MS5	0.7508	SN2	0.7620	GR1	0.9372
ID5	0.7325	KM2	0.7883	SN3	0.8312	GR2	0.9408
ID6	0.7374	KM3	0.8472	SN4	0.7751	IM1	0.7172
OG2	0.7928	KM4	0.8401	SN5	0.7193	IM2	0.6762
OG3	0.7153	KM5	0.6292	VT1	0.6591	IM3	0.8113
OG4	0.7859	PU2	0.7986	VT2	0.7675	IM4	0.8279
OG5	0.7992	PU4	0.8163	VT3	0.7301	DF1	0.7601
OG6	0.7781	PU5	0.6651	IN1	0.8444	DF2	0.7031
TC1	0.7788	PU6	0.6681	IN2	0.7642	DF3	0.8604
TC2	0.8289	PU7	0.7604	AD1	0.8469	DF4	0.7295
TC3	0.8658	PU9	0.7134	AD2	0.8438		

Internal consistency of the latent variables was measured following the procedure of Fornell and Larcker (1981). Table-2 shows that all the latent variables have internal consistencies above 0.7, indicating that the constructs are internally consistent and hence reliable.

Table-2: Internal Consistencies

Latent Variables	Internal Consistencies	Latent Variables	Internal Consistencies
External Inspiring	0.852	Usefulness	0.878
Individual Factors	0.833	User-friendliness	0.869
Organizational Factors	0.885	Initiation	0.789
Management Support	0.831	Adoption	0.868
KMS Characteristics	0.862	Pilot Implementation	0.854
Task Complexity	0.863	Organizational Implementation	0.844
Subject Norms	0.870	Organic Growth	0.938
Voluntariness	0.766	Diffusion	0.854

Discriminant validity of the latent variables was tested using the procedure of Fornell and Larcker (1981). Square roots of the AVEs shown in the main diagonal of Table-3 are comparing with the correlations among the latent variables (off-diagonal elements). For adequate discriminant validity square root of the AVE should be greater than the off-diagonal elements in the corresponding rows and columns (Barclay et al. 1995). Table-3 indicates that the discriminant validity of the latent variables are met, which means that all the latent variables are different from each other.

Table-3 Correlations among Constructs

	EX	ID	OG	MS	KM	TC	PU	UF	VT	SN	IN	AD	PT	GR	IM	DF
EX	**0.861***															
ID	0.320	**0.708**														
OG	0.383	0.623	**0.779**													
MS	0.390	0.570	0.618	**0.706**												
KM	0.309	0.501	0.554	0.588	**0.783**											
TC	0.274	0.388	0.404	0.394	0.369	**0.823**										
PU	0.330	0.405	0.478	0.445	0.475	0.508	**0.740**									
UF	0.238	0.382	0.392	0.449	0.497	0.328	0.403	**0.831**								
VT	0.229	0.494	0.508	0.439	0.510	0.352	0.434	0.394	**0.724**							
SN	0.248	0.369	0.423	0.429	0.413	0.428	0.378	0.356	0.488	**0.757**						
IN	0.164	0.403	0.345	0.378	0.444	0.332	0.419	0.285	0.506	0.421	**0.808**					
AD	0.263	0.386	0.470	0.525	0.564	0.352	0.350	0.445	0.472	0.382	0.433	**0.827**				
PT	0.190	0.363	0.499	0.497	0.547	0.399	0.368	0.407	0.451	0.373	0.464	0.652	**0.814**			
GR	0.275	0.403	0.517	0.479	0.547	0.369	0.475	0.480	0.533	0.489	0.537	0.542	0.516	**0.940**		
IM	0.223	0.374	0.505	0.393	0.482	0.369	0.442	0.390	0.538	0.444	0.524	0.598	0.598	0.629	**0.755**	
DF	0.308	0.400	0.507	0.519	0.585	0.441	0.557	0.550	0.578	0.552	0.463	0.564	0.513	0.575	0.575	**0.771**

(* the bold elements in the main diagonal are the square roots of AVE)

4.3 The Structural Model and Tests of Hypotheses

Table-4 shows the results of the structural model. It is observed that not all the hypotheses are supported.

Table-4 Results of Hypothesis Testing

Structural Relations Independent → Dependent Variables	Hypothesis	Standardized Path Coefficient (t-value)	Significance of Hypothesis
External Inspiring →Perceived Usefulness	H1	0.097 (1.698)	Yes*
Individual Factors →Perceived Usefulness	H2	0.043 (0.349)	No
Organizational Factors →Perceived Usefulness	H3	0.165 (2.040)	Yes**
Management Support →Perceived Usefulness	H4	0.057 (0.713)	No
KMS Characteristics →Perceived Usefulness	H5	0.108 (1.273)	No
Task Complexity →Perceived Usefulness	H6	0.286 (5.656)	Yes***
User Friendly →Perceived Usefulness	H7	0.136 (1.861)	Yes*
User Friendly →Organic Growth	H8	0.205 (3.226)	Yes***
Perceived Voluntary Use →Organic Growth	H9	0.240 (3.895)	Yes***
Subject Norms →Organic Growth	H10	0.225 (2.559)	Yes**
Perceived Usefulness →Initiation	H11	0.421 (6.691)	Yes***
Initiation → Adoption	H12	0.441 (7.114)	Yes***
Adoption → Pilot Implementation	H13	0.651 (14.292)	Yes***
Pilot Implementation → Organic Growth	H14	0.233 (3.561)	Yes***
Organic Growth → Organizational Implementation	H15	0.627 (16.379)	Yes***
Organizational Implementation → Diffusion	H16	0.577 (13.074)	Yes***
R^2 for Perceived Usefulness= 0.379, R^2 for Initiation =0.175, R^2 for Adoption =0.188, R^2 for Pilot Implementation =0.425, R^2 for Organic Growth =0.456, R^2 for Implementation = 0.396 R^2 for Diffusion = 0.331			

Note: *p < 0.05; ** p < 0.025; *** p < 0.005

5. Discussion

5.1 Hypotheses H1-H6

It is interesting to observe that three hypotheses related to "External stimulus" (H1 – H6) are not significant. Our analyses show that "individual factors" of the users, "management

support", and "KMS characteristics" do not influence perception of "usefulness" of KMS, which previous literature found to be significant in other technology adoption/diffusion studies. It is also observed that in KMS adoption/diffusion "external influence", "organizational factors", and "task complexity" are the significant factors in influencing the perceived usefulness of KMS. One possible explanation for the non-significance of KMS characteristics is that required technologies (intranet, databases, communication tools, etc) for managing knowledge is already in place and are available to people. Everyone has thus become familiar with those technologies. As a result, people may tend to take this availability for granted and hence is the indifference to KMS Characteristics as an influencing factor in the KMS adoption. The non-significance of individual factors on perceived usefulness of KMS could be explained in a similar way. Nowadays using technologies (intranet, databases, communication tools, etc) to communicate and to seek and share knowledge is part of people's routine in their organizational life. People with various responsibilities at different levels of organization have heavily relied on technologies to do their job, to collaborate with others, and to be more productive, creative and innovative.

It is most unexpected to see that management support factor does not influence the perceived usefulness of KMS. This provides an interesting challenge for the would-be adopters of KMS in Australian organizations. Top-level executives of these organizations should plan it carefully as their support does not guarantee the positive influence on the usefulness of KMS. They must look deeply into the task factors and organization factors to see if these factors are conducive to KMS use. Davenport and Glaser (2002) suggest that knowledge-sharing programs often fail for the reason that they make it harder, not easier, for people to perform their tasks. Those at the top of an organization should have to find the knowledge needs of the business. Simply investing money in IT only can produce more examples of KM failures and waste of investment. Leaders have to take account of issues such as culture, structure, process, training and development. More attention should be given to people since businesses make profits through selling and effectively using their knowledge (tacit knowledge) (Sveiby 1995; Lioyd and Stewart 2002). Organizations exist within an "open" environment where external influences such as changes in the marketplace and increasing customer demand for value-for-money and better services have big impact on internal operation (Ward 1994; Moffett et al.,

2003). Through fostering collaborative practices and knowledge sharing, organizations can learn the external environment better and respond to their customers better.

5.2 Hypotheses H7-H11

The second set of hypotheses (H7-H11) is related to the perception of a KMS influencing its diffusion process. Our results suggest that user friendliness, perceived voluntariness, and subject norms influence organic growth of a KMS in an organization, which is in line with the literature. A knowledge management system has to be useful, otherwise organizations and individuals won't have interest to adopt or use it. On the other hand, a knowledge management system has to be easy to use and be user friendly, otherwise potential adopters of knowledge management system won't adopt or use the system even though it is useful, since this is human nature to go for easier option. Knowledge management systems must have user-focus and take people's needs into consideration. People will use the knowledge management system when they see the value of using the system. Forced use of the system is not the ideal approach and won't go far enough. Also when people are forced to use a system, they frequently use it in ways that do not benefit the organization (Bansler & Havn 2002). In the mean time, people's use of knowledge management system can be influenced by others, such as leaders, peers, respected people, etc. People will use knowledge management system as per their perceptions of what others think they should do.

5.3 Hypotheses H12-H16

The results show that all the hypotheses related to the sequence of stages in the KMS diffusion process are significant (H12-H16; Table-4). To the best of the researchers' knowledge no empirical test for the sequence of stages is available in the literature. This study provides an empirical test of the sequence of stages in the diffusion process.

6. Conclusion and Future Research Directions

This study tested a model of antecedents of KMS adoption and diffusion process (see Figure-1). The results indicate that organizations need to effectively and systematically manage their knowledge to survive in today's highly competitive and uncertain market by establishing pro-knowledge sharing structure, culture, policy, rewarding systems, IT infrastructure and business processes. Prior to embarking on knowledge management systems, organizations need to identify the required knowledge need for their business and understand how

knowledge management systems can help them. In order to achieve good acceptance, knowledge management systems have to be both useful and user friendly. Any KMS has to be extremely user-friendly for any level of users to use it effectively, and it has to be useful for the task to be dealt with. Policy also must be implemented to facilitate the voluntary use of KMS. It is noted that any kind of norm (pressure) creation is unlikely to make it grow effectively within the organization. Furthermore, a clear planned sequence must be adopted for the effective adoption and diffusion process of KMS. This study tested the whole model. In the future, parts of the model can be extracted and investigated in detail, i.e., testing the antecedents of perceptions of KMS, examining the differences between adopters and non-adopters, studying the effect of external variables (i.e., size, industry) on the adoption decision of KMS, etc.

References

Alavi, M., and Leidner, D. E. "Knowledge Management Systems: Issues, Challenges, and Benefits," *Communications of the Association for Information System* (1:7), 1999, http://cais.isworld.org./articels/1-7/article.html.

Alavi, M., and Leidner, D.E. "Knowledge management and knowledge management systems: Conceptual foundations and research issues," *MIS Quarterly* (25:1), 2001, pp. 107-146.

Bansler, J. P., and Havn, E. "Exploring the role of networks in IT implementation-The case of knowledge management systems," *The Xth European Conference on Information Systems,* Gdansk, Poland, June 2002.

Barclay, D, Higgins, C., and Thompson, R. "The Partial Least Squares (PLS) Approach to Causal Modelling: Personal Computer Adoption and Use as an Illustration," T*echnology Studies* (2:2), pp. 285-309.

Davenport, T. H., and Glaser "Just-in-time delivery comes to knowledge management," *Harvard Business Review* (July), 2002, pp.107-111.

Duke, S., Makey, P., and Kiras, N. *Knowledge Management* (1), 1999, Butler Group, Hull, UK.

Fornell, C., and Larcker, D. F. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (XVIII), 1981, pp. 39-50.

Lioyd, B., and Stewart, T. A. "Leadership and Knowledge Management," *Leadership & Organization Development Journal* (23, 5/6), 2002, pp. 288-292.

Moffet, S., McAdam, R., and Parkinson, S. "An empirical analysis of knowledge management applications," *Journal of Knowledge Management* (7:3), 2003, pp. 6-26.

Sarvary, M. "Knowledge management and competition in the consulting industry," *California Management Review* (41:2), 1999, pp. 95-107.

Sveiby, K. "Small Knowledge Companies-Wave of the Future," 1995, http://www.sveiby.com.au/KnowledgeOrganizationsAust.html.

Ward, M. "Why your corporate culture isn't working and what to do about it," *Part 1, Organizational Culture and Change*, Gower, London, 1994.